GROWERTALKS

Features

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Does Feeding Your Plants Affect Aphids?

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Climbing fertilizer prices and potential legislation regulating fertilizer runoff have increased greenhouse grower interest in reducing fertilizer inputs. The majority of greenhouse operations don't capture runoff from their operations and, therefore, the nitrogen and phosphorus released by fertilizers may become a non-point source of pollutants.

To respond to increasing fertilizer prices and regulatory pressure, growers are increasingly interested in voluntarily adopting reduced fertilizer input strategies for growing their crops, such as controlled-release fertilizers (CRF) or reduced rates of water-soluble fertilizers (WSF).

In preliminary work by Dr. Neil Mattson, CRF reduced N and P leaching of potted chrysanthemums by five to 10-fold vs. WSF controls. However, more work is needed to determine application rates for other common bedding plants and vegetable transplants.

Plant fertility may also affect the population growth of aphids and other pests. Aphids use their piercing-sucking mouthparts to tap into a plant's vascular system to feed on the sap in the phloem. The nutrients in the sap are very dilute and the sap even lacks some of the aphids' essential nutrients.

But aphids have modified guts that can filter the dilute nutrients from the sap and they're actually dependent on special bacteria that live within their bodies to manufacture the essential nutrients that aphids need. An increase in the nutrients in the sap from fertilizers may be beneficial to aphids.

Some studies have shown that high WSF applications can promote increased populations and faster population growth of green peach aphids and melon/cotton aphids. No work has been done to determine the effect of CRF fertilizers on aphid populations, but the use of CRF might reduce luxury fertilizer consumption by the plant, leading to slower aphid population growth, which could make chemical or biological control of aphids easier.

The test

We sought to evaluate the effect of seven fertilizer treatments on aphid population growth. In addition to WSF

and CRF fertilizers, we also included an organic slow-release fertilizer because of grower interest in organics.

Besides a water-only control, we used a 21-5-20 WSF at 50 ppm or 150 ppm N, Osmocote Bloom CRF 12-7-18 at 1.75 or 3.5 lbs. per cubic yard of potting mix, and Verdanta EcoVita 7-5-10 organic at 3 or 6 lbs. per cubic yard of potting mix. We used these fertilizers to grow crops of pansies and peppers. Plants were grown from seed with 150 ppm N 21-5-20 WSF, three times per week for six weeks, then were transplanted into 4-in. pots and grown for two weeks with one of the seven fertilizer treatments.

Then three adult female aphids of either green peach aphid or foxglove aphid were placed on each plant and allowed to reproduce for two weeks. We then harvested the plants and counted all of the aphids on all the plants. We also measured percent tissue N from plant samples for each treatment.

Photo 1: Peppers grown for 10 weeks with one of seven fertilizer treatments. From left to right: Water alone; Water-soluble fertilizer at 50 ppm; Water-soluble fertilizer at 150 ppm; Osmocote Bloom 12-7-18 at 1.75 lbs. per cubic yard; Osmocote at 3.5 lbs. per cubic yard; Verdanta EcoVita 7-5-10 organic at 3 lbs. per cubic yard; and Verdanta at 6 lbs. per cubic yard

There was a clear effect of these fertilizers on the growth of peppers (Photo 1), with both rates of WSF producing the largest plants with the highest percent N in the plant tissue (Table 1). Differences between the CRF and organic fertilizers at either rate were less obvious, though the plants were larger and had more tissue N than the water-only controls.

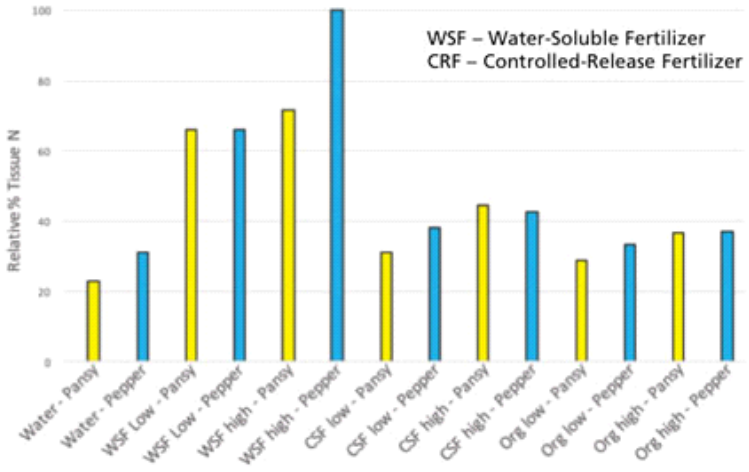

Table 1. Relative total percent nitrogen in the tissues of pansy and pepper plants after four weeks of growth with seven fertilizer treatments.

Pansies exhibited less dramatic effects of fertilizer as compared to peppers. Despite similar plant size across fertilizer treatments, there was a higher percent N in the tissue of the plants fertilized with WSF than the other fertilizers (Table 1).

But what about the aphids? Were they affected? Table 2 shows that, on peppers, green peach aphid populations were much larger on the WSF peppers than the other peppers. Because the reproductive rate of foxglove aphids is always lower than that of green peach aphids, the foxglove aphid populations were much smaller than the green peach aphids, but the pattern of their response to the fertilizer treatments was the same.

As with green peach aphid, foxglove aphid numbers were much higher with WSF than with the other fertilizers. The numbers of both kinds of aphids mirrored the N level in the tissue of the peppers (Tables 1 and 2). Thus, on peppers, the WSF resulted in higher aphid populations than the other fertilizers and the higher the WSF rate, the more aphids. There was little difference in the effect on the aphids by the other fertilizers, regardless of type of fertilizer or rate. However, again, CRF, or organic fertilizer, also led to smaller pepper plants.

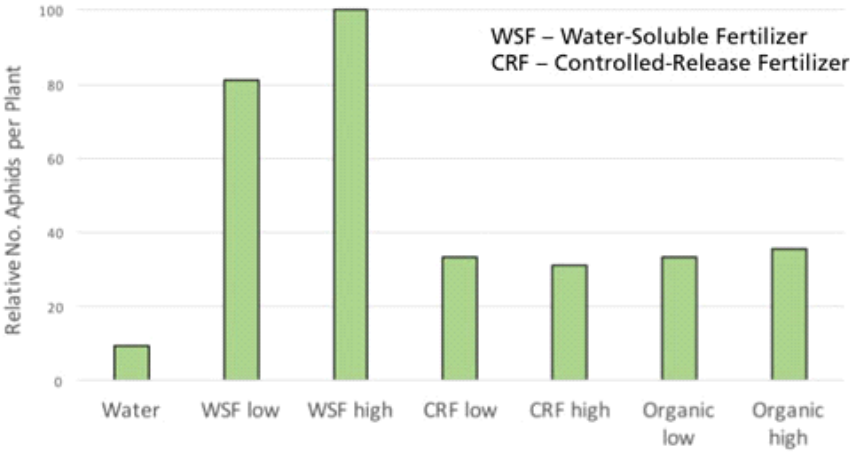

Table 2. Relative numbers of green peach aphids on peppers grown with one of seven different fertilizer treatments.

But the results were very different on pansies. Table 3 indicates that there was no substantial difference in green peach aphid populations on pansies, regardless of fertilizer type or rate. And the same was true with foxglove aphid. Even though the percent N in plant tissue was higher on the WSF pansies than the other fertilizer treatments (Table 1), this didn't result in significant differences in aphid numbers.

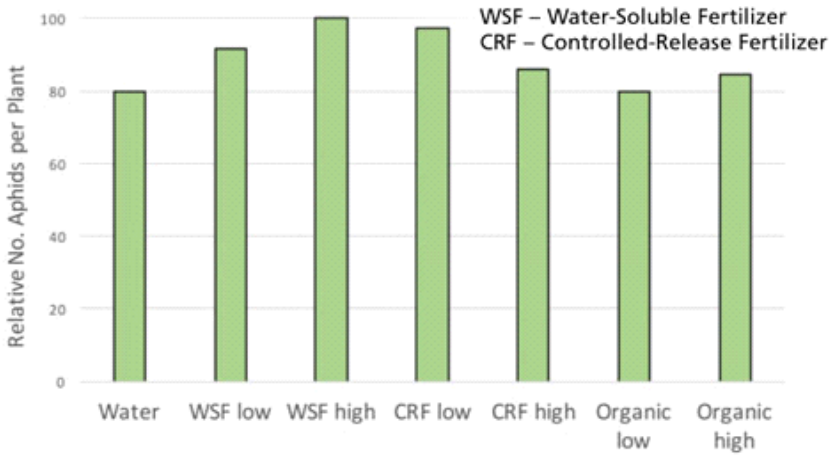

Table 3. Relative numbers of green peach aphids on pansies grown with one of seven different fertilizer treatments.

Contrary to expectations and our results on peppers, more fertilizer didn't result in more aphids on pansies for either aphid species. It looks like more work needs to be done to be able to predict the interactions between aphids and plant nutrition, and to be able to use this information to optimize aphid management. But these results from pansies provide at least one example where more fertilizer didn't result in more aphids.

In a separate experiment, we evaluated whether two fertilizer treatments affected the success of biological control, using green peach aphid and foxglove aphid on peppers. We used only two fertilizer treatments via capillary mat: WSF at 75 ppm and Osmocote Bloom at 3.5 lbs. per cubic yard. The aphid parasitic wasp Aphidius colemani provided 80% control of green peach aphid after 10 days of a single release of two female wasps per square foot for both fertilizer treatments.

And Aphidius ervi at the same release rate reduced foxglove aphids by 85% of the control plants, regardless of fertilizer treatment. So, under the conditions of these experiments, we didn't see an effect of fertilizer on biological control success.

We're evaluating various indicators that might be used to predict the interactions between plant species, fertilizer and aphids, so that growers can make informed decisions about how fertilizer use may affect aphid management. **GT**

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